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DISSEMINATION OF WEATHER INFORMATION IN THE AIR TRAFFIC CONTROL SYSTEM

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FINAL REPORT

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16. Abstract

This report addresses the present day methods of disseminating weather information in the Air Traffic Control System. The report is based on the information gathered during visits to various air traffic control facilities by a Federal Aviation Administration Technical Center team. The team responsibility was to observe and analyze weather dissemination methodologies and to interview involved personnel.

Based on the data gathered and the problems identified, recommendations are made which can be implemented in the near-term (9 to 12 months). These recommendations, if adopted, may require some modification or redirection of current orders defining weather dissemination procedures. Also included are recommendations for purchase of new, but off-the-shelf, automating equipment which should aid in the timely deliverance of needed weather products to the users. A trip report, noting observed facility-by-facility dissemination problems, is included as appendix A.

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PREFACE

The purpose of this study is to investigate the present weather dissemination procedures used in the Air Traffic Control System and to identify weaknesses. Improved methodologies are suggested where needed. A special emphasis is placed on the dissemination of hazardous weather information. The goal is to improve timeliness and quality of disseminated weather information. Recommendations made in this report are confined to those solutions which can be field implemented within 9 to 12 months. A longer range program that is currently in progress provides for complete automation of weather data dissemination. This study has been prepared by the Federal Aviation Administration (FAA) Technical Center at the request of the Systems Research and Development Service (SRDS), in response to 9550-1 Effort Request Number AAT-300-31, dated June 5, 1980.

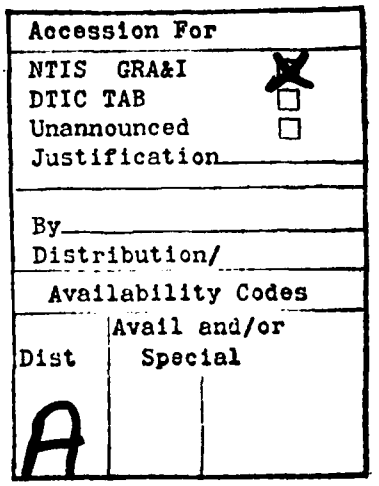

TABLE OF CONTENTS

LIST OF ABBREVIATIONS

ARTCC	Air Route Traffic Control Center
ARTS	Automated Radar Terminal System
ATIS	Automatic Terminal Information Service
CFWSU	Central Flow Weather Service Unit (Washington, D.C.)
CWA	Center Weather Advisory
CWSU	Center Weather Service Unit
FDEP	Flight Data Entry/Printout
FSS	Flight Service Station
GI	General Information
NAS	National Airspace System
NSSFC	National Severe Storms Forecast Center (Kansas City)
NWS	National Weather Service
PIREP	Pilot Report
PVD	Plan View Display
SIGMET	Significant Meteorological Information
TRACON	Terminal Radar Approach Control
TWEB	Transcribed Weather Broadcast
VOR	Very High Frequency Omnidirectional Range
WSFO	Weather Service Forecast Office

INTRODUCTION

BACKGROUND.

Alerting pilots and air traffic controllers to potentially hazardous weather is essential for safe flight, efficient use of airspace, and timely decisionmaking. There have been substantial improvements recently to ensure that aviation weather information is properly screened and selectively disseminated to reduce the impact weather can have on traffic flow management and individual flight operations. One of the most significant of these improvements has been the establishment of the Center Weather Service Unit in Air Route Traffic Control Centers (ARTCC's) nationwide.

The concept of the Center Weather Service Unit (CWSU) was implemented in 1978 following an agreement established between the Federal Aviation Administration (FAA) and the National Oceanic and Atmospheric Administration. The agreement called for the addition of a meteorologist's position within each of the 21 ARTCC's in the contiguous United States and Alaska. In addition, the FAA has designated a weather coordinator for each CWSU to serve as the interface between the meteorologist and the Air Traffic Control System. Each CWSU is presently staffed by a meteorologist and a weather coordinator for 16 hours each day and a weather coordinator, only, for 8 hours each day (the midnight shift). The duties of the CWSU meteorologists are to (1) analyze and interpret meteorological data, (2) prepare the warning and "nowcast" notices, and (3) issue timely and accurate aviation weather information to the weather coordinator. The weather coordinator then disseminates the weather information to Center controllers and to all air traffic facilities under the ARTCC's area of responsibility. The CWSU Handbook, FAA Order 7210.38 (reference 1), established the CWSU operational procedures and the responsibilities of the meteorologist and the weather coordinator. It is reasoned that the present system of disseminating weather information can be improved. This study addresses potential areas for improvement.

APPROACH.

An FAA Technical Center team was formed to visit selected air traffic facilities for the purpose of observing currently used dissemination methods. These visits were conducted November 16 to 22, 1980. During these visits, data were collected on current procedures, weather message content, utilization, and methods of dissemination.

The cities and facilities visited were:

1. Cleveland, Ohio
   a. Cleveland ARTCC, Oberlin, Ohio
   b. Hopkins Approach Control, Cleveland, Ohio
   c. Lakefront Tower, Cleveland, Ohio
2. Chicago, Illinois
   a. Chicago, ARTCC, Aurora, Illinois
   b. O'Hare Aproach Control, Chicago, Illinois
   c. DuPage County Airport Tower, DuPage County, Illinois
   d. DuPage County Flight Service Station, Illinois
3. Denver, Colorado
   a. Denver ARTCC, Longmont, Colorado
   b. Stapleton Approach Control, Denver, Colorado

In addition to the observations and analysis of the team, interviews were held with facility chiefs, data systems officers, area supervisors, weather

coordinators, CWSU meteorologists, and flight specialists. The results of these interviews, observations and the subsequent analysis are the basis for problem identification and recommended solutions. A trip report is included as appendix A.

DISSEMINATION PROBLEMS AND SOLUTIONS

For each of the areas, the nature of an observed field problem is discussed, followed by recommended solutions and alternate solutions when appropriate.

DISSEMINATION OF WEATHER MESSAGES WITH SIMILAR CONTENT.

PROBLEM. The National Weather Service (NWS) originates and disseminates significant meteorological information (SIGMET) and Convective SIGMET. The time taken to prepare and disseminate these messages to aviation users is often lengthy. As a result, the information is frequently useless to pilots and air traffic controllers by the time it is received. Often the CWSU meterologist is aware that these NWS-generated messages are forthcoming and does not issue a Center Weather Advisory (CWA) to avoid redundancy.

However, the CWSU meteorologist, by virtue of his proximity to users of aviation products, can get more timely information to users by issuing the CWA rather than waiting for the NWS message. But if the CWA is issued and is followed by a Convective SIGMET/SIGMET, much of the CWA message content may be duplicated by the Convective SIGMET/SIGMET. This is a problem because the weather coordinator must disseminate the SIGMET/Convective SIGMET even if the meteorological problem is covered by the previously issued CWA.

This duplication also uses valuable General Information (GI) message resources at a time when such resources are in heavy demand.

RECOMMENDED SOLUTION. The CWSU meteorologist should prepare and issue a CWA to the weather coordinator for dissemination whenever conditions warrant. The meteorologist should not wait for the Convective SIGMET/SIGMET from the NWS before making a decision to prepare and issue the CWA (reference 1, attachment 1, paragraph 6.2.3b). In the case where the CWA has been disseminated to users and the Convective SIGMET/SIGMET covering the same weather event is received some time later, the CWSU meteorologist should have the authority to halt the continued flow of the message beyond his station. The message should be compared to the CWA, and if it is redundant, it should not be disseminated further. If the Convective SIGMET/SIGMET contains information not covered by the CWA, the meteorologist should prepare an appropriate CWA update for dissemination by the weather coordinator. If the Convective SIGMET/SIGMET arrives at the CWSU before a CWA has been prepared and disseminated, the CWSU meteorologist should inspect the message content, determine the ARTCC area(s) affected, and issue the message as a Convective SIGMET/SIGMET to the weather coordinator for dissemination. These changes, if adopted, should be implemented by a change order to the CWSU Handbook. These special duties should not be given to the weather coordinator in the meteorologist's absence.

DISSEMINATION TO FLIGHT DATA ENTRY/PRINTOUT-EQUIPPED TERMINAL FACILITIES.

PROBLEM. CWA's, Convective SIGMET's, and SIGMET's are sent in GI message format to flight data entry and printout (FDEP)-equipped terminal facilities from the ARTCC. Due to storage capacity and slow response time, some of the earlier models of the ARTCC computers have saturation problems. This saturation is particularly prevalent during severe weather conditions due to an excess of control type messages. Because of the lower priority of the GI message, some of the CWA's, Convective SIGMET's and SIGMET's are not accepted for

transmission by the computer when saturation occurs. If the GI message is received at the terminal facility, the flight strip generated on the FDEP is passed by hand from controller to controller for broadcast to pilots. In some cases the abbreviated message text is translated manually into expanded English text for clarity before intrafacility dissemination. This is the procedure generally used in FDEP-equipped nonapproach control towers and in approach control towers that have an FDEP position in both the cab and the Terminal Radar Approach Control Facility (TRACON).

In approach controls that have an FDEP position in the tower cab only, the flight strip weather message is passed from controller to controller in the cab for broadcast to pilots. The message is then sent via the pneumatic tube to the TRACON. There, the message is again passed by hand to all controllers for broadcast to pilots.

In approach controls that have an FDEP position in the IFR (radar) room only, the data message is passed from controller to controller for broadcast, and then it is phoned to the tower cab. In the cab, the information is hand copied for distribution to controllers and broadcasted to pilots. These methods of intrafacility dissemination result in extreme delays (as much as 30 minutes) in broadcasting information to aircrews. This can result in nonreceipt by aircraft in handoff status because the sending and receiving controllers do not broadcast the weather message concurrently.

RECOMMENDED SOLUTION. Implement a low cost commercially available alphanumeric display system similar to that used in the Cleveland Hopkins Airport TRACON and also similar to the Motorola Information Display System (IDS™). It is recommended that the concept be defined so that an intelligent central control unit can be installed at the CWSU position as well as the flight data position in the TRACON. These two central control units should be interconnected by modems and a dial-up, voice-grade telephone line. Weather messages normally entered by the weather coordinator in GI message form should use the central control unit for dissemination to terminal facilities outside the ARTCC. ARTCC intrafacility message dissemination should be continued in GI format using the normal ARTCC computer input devices (output on flight strip printers in the ARTCC sectors), or an interface should be developed between the CWSU central control unit and the ARTCC computer so weather messages would need to be input only once (on the central control unit keyboard) by the weather coordinator.

In the TRACON weather messages normally received on the electrowriter from the local NWS office or from the Central Flow Weather Service Unit (CFWSU) via hotline should be entered through the keyboard at the flight data position. Incoming messages from the CWSU should be automatically disseminated intrafacility via the IDS. The TRACON central control unit should drive slave displays at positions within the IFR room and cab. Weather data can be displayed instantly after entry for broadcast at all controllers' positions. Adequate display capacity and slave paging must be planned. FDEP-equipped towers within the terminal area should also be furnished with cathode-ray tube (CRT) displays or printers slaved from the TRACON central control unit. This will require telephone communications and separate ports on the TRACON master unit. All components of such a system are commercially available from the General Services Administration (GSA) schedule (e.g., Motorola IDS).

ALTERNATE SOLUTION. Voice record the weather data for later access by controllers using the interphone. Controllers could be alerted to a recording change by an annotation in the

Automated Radar Terminal Systems (ARTS) data area similar to an Automatic Terminal Information Service (ATIS) change. The recording could be revised for transmission on individual controller frequencies, thereby reducing controller workload. Although less costly, this solution is deemed less efficient than the previous solution.

DISSEMINATION TO NON-FDEP TERMINAL FACILITIES.

PROBLEM. Currently, CWA's, SIGMET's and Convective SIGMET's are sent by the ARTCC using the GI message format to all air traffic control facilities except non-FDEP towers. Non-FDEP facilities must be called individually, using service "F" (telephone line) interphone, and the information passed verbally. This is a lengthy process and can, because of facility workload and staffing, result in late or nonreceipt of the data.

RECOMMENDED SOLUTION. Remote a terminal from the nearest CWSU or TRACON central control unit of the system described in recommended solution of previous section. The output device should be a low-cost, off-the-shelf line printer.

ALTERNATE SOLUTION. Provide for conference call capability with an auto-dial system at the CWSU station for simultaneous dissemination. Add a low-cost call recorder with alerting periods at the individual towers. Subsequent broadcast of the recorded information can be executed by a "double-button" procedure or broadcasted by the controller, depending on workload.

CWSU ADVISORY FORMAT/DISSEMINATION STANDARDIZATION.

PROBLEM. Despite the requirement to do so by FAA Order 7210.38, advisories issued by the CWSU meteorologist are not always standardized by title. Most CWSU meteorologists issue CWA's, but at least one issues no advisories under this name, but rather entitles them, "Special Weather Statements." In addition, CWSU advisories vary in format from near Convective SIGMET form (general) to area-by-area advisory form. In many cases users of the CWA and Convective SIGMET are confused about the duplication and purpose of these messages.

RECOMMENDED SOLUTION. Insure standardization of the message title so that all special advisories issued by the CWSU meteorologist are called "Center Weather Advisories." Standardize the format of CWA's so they use navigational aids and VOR airways and jet routes as reference points for weather. This reference system is operationally useful to controllers, flight service specialists, and aircrews. Standardize the dissemination of CWA's, so that all facilities within the ARTCC area receive only the advisories that affect them. Flight Service Stations should receive all CWA's for preflight/in-flight briefings. Determination of what facilities receive the advisory can be accomplished with an index referencing the ARTCC geographical areas that are affected.

LACK OF SELECTIVE ADDRESSING.

PROBLEM. The ARTCC 9020 computer uses facility-oriented addressing methodology; i.e, messages may be sent to all approach control towers, all Flight Service Stations, etc. Usually a CWA SIGMET/Convective SIGMET is not facility-oriented but area-oriented. However, addressing GI messages to individual facilities within an area is too time consuming. Therefore, the message, using the available group (facility) addressing, is sent to many locations that do not require the data. This overkill also expends computer processing time and unnnessarily ties up FDEP printers.

RECOMMENDED SOLUTION. Add an additional scheme to the 9020 adaptation. The scheme should sort facilities by

geographical area not by facility type. This process could be worked out by the Center data systems specialists for their particular ARTCC 9020. For example; area of specialization "A" contains:

1. ARTCC sectors within area "A"
2. Approach controls within area "A"
3. Flight Service Stations within area "A"
4. FDEP-equipped towers within area "A"

ONE-TIME BROADCAST METHODOLOGY.

PROBLEM. One-time controller broadcast of SIGMET's and Convective SIGMET's to all aircraft result in several system weaknesses. Lengthy broadcasts, as in the case of Convective SIGMET's, cannot be comprehended by aircrews in a single transmission. This often results in requests by the aircrew for clarification or retransmission of parts or all of the message. Since broadcasts are not simultaneous, some aircraft in hand-off status may miss the broadcast. Further, aircraft receivers must be tuned to the assigned frequency for weather message broadcasts at broadcast time. For controllers, the broadcast is time consuming, and requests for retransmission aggrevate the problem. Hourly broadcast procedures and updates for SIGMET's and Convective SIGMET's (CWA's, too, if broadcast) are almost unusable because of message age, scope of the report, and/or irrelevancy of the geographical area.

RECOMMENDED SOLUTION. Interrupt the routine voice broadcast on Very High Frequency Omnidirectional Range (VOR)/ Transcribed Weather Broadcast (TWEB) outlets and place all hazardous weather messages on short duration, but continuous broadcast, over these dissemination media. Another possibility is to delete all but hazardous weather messages when conditions warrant; i.e., use the VOR/TWEB voice to broadcast in a routine manner until severe weather is within range of the transmitter. During severe weather conditions, use the medium for SIGMET's, Convective SIGMET's, CWA's, and pilot reports (PIREP's) only. This will require rapid dissemination of weather messages from the CWSU to appropriate Flight Service Stations. The automatic dissemination system discussed in the Dissemination to FDEP-Equipped Terminal Facilities section could be used in concert with this capability.

ALTERNATE SOLUTION 1 (NOT FOR NEAR-TERM IMPLEMENTATION). Establish a separate nationwide frequency (similar to the one used by the En Route Flight Advisory Service) for continuous broadcast of hazardous weather conditions. The data should be disseminated to Flight Service Stations by the CWSU meteorologist by phone (autodial). The message should be taped at the Flight Service Station, with Convective SIGMET's, SIGMET's, and PIREP's added at the Flight Service Station (a 3- to 5-minute message). The taped message should be broadcast continuously. This process would free the 122.0 megahertz radiofrequency for data collection only (namely, PIREP's), thereby reducing frequency congestion.

ALTERNATE SOLUTION 2 (NOT FOR NEAR-TERM IMPLEMENTATION). Delete the requirements for one-time broadcast of SIGMET and Convective SIGMET messages. Instead, develop an En Route Center ATIS capability; i.e, a continous recording of pertinent weather in the ARTCC area. As with the present ATIS, the aircrew would tune to a discrete frequency for that Center and receive the latest weather information.

UTILIZATION OF PIREP DATA.

PROBLEM. The most valuable weather data to an aircrew is a current report of the

actual weather conditions given by a pilot who has just flown through the area — the PIREP. Presently, there is little systematic collection, analysis, and dissemination of these data.

RECOMMENDED SOLUTION. Request that pilots preface their reports with Greenwich mean time, flight level, and distance from a navigational aid (any). Require that all PIREP's, when received, be sent by controllers and flight specialists to the CWSU meteorologist or weather coordinator. The meteorologist/ weather coordinator should log all PIREP's. Using selective addressing schemes (see Lack of Selective Addressing section) and new broadcast methodology (see One-Time Broadcast Methodology section), PIREP's should be disseminated appropriately. In addition, the CWSU meteorologist should use these PIREP's in preparation of CWA's. Further, the CWSU meteorologist/ weather coordinator should have the capability to initiate a request for a PIREP from any pilot under ARTCC control through the sector controller.

LACK OF FULL EN ROUTE/TERMINAL RADAR DISPLAY CAPABILITY.

PROBLEM. Several en route/terminal radar capabilities that lend themselves to improvements in weather data dissemination are not stipulated in the FAA Order 7210.38 or specifically detailed for that purpose in the National Airspace System (NAS) specification. These capabilities, utilizing the CWSU meteorologist's plan view display (PVD) and its functions, would aid appreciably in the dissemination of hazardous weather data from the CWSU to en route and terminal air traffic controllers. Though these capabilities have not been tested, it is believed they could be instituted with a minimum of software modification.

RECOMMENDED SOLUTION 1 (CWSU STORM CONTOURING USING THE PVD). The CWSU meteorologist can use his PVD to create a track identification of a specific storm (labeled, for example, as "STM1"). The TRACK REROUTE function of NAS 3d2.10 can then be used to contour the hazard zone boundary as determined by the meteorologist. The meteorologist, using up to four trackball positions (three if the aircraft identification is captured using the trackball) and the fix-radal-distance positions, can draw a polygon around the storm area. Polygons (up to three at any time on a single PVD) can be viewed by en route controllers using a ROUTE READOUT request. As the hazardous weather area moves, the CWSU PVD can be used to alter the shape and location of the hazard zone using TRACK REROUTE. The meteorologist will eventually drop TRACK on the storm identification as the storm moves out of the ARTCC area. Using this methodology, the meteorologist can use his weather radar information to annotate the weather-fixed map unit data displayed to controllers. If this scheme is adopted, it is important that controllers understand exactly what intensity levels are displayed.

RECOMMENDED SOLUTION 2 (STORM CELL TRACKING USING THE PVD). The CWSU meteorologist can start a track, identified by a storm number (say "STM2"), using the trackball coordinates and an initial velocity vector equal to the movement of the storm center (direction/speed). If the track is set to "manual coast" (as opposed to "system coast"), it will continue to track (dead reckon) with the initial velocity parameters. Storm tops can also be entered as reported altitude in the data block. Several such tracks can be started, as necessary, to depict cell movement. Controllers on the floor can see these track locations by simply using the QUICK LOOK capability to view all tracks entered on the CWSU PVD.

RECOMMENDED SOLUTION 3 (NAS-TO-ARTS HANDOFF). The same tracks started in Solution 2 may be reinitiated to remove the coast status and then handed off to any subordinate ARTS III facility. The data block would then appear on the

receiving ARTS Data Entry Display System until it goes into coast or suspend status.

WEATHER INFORMATION FLOW TO PILOTS.

PROBLEM. En route air traffic controllers are not required to broadcast CWA's to pilots. They are required to broadcast the text of Convective SIGMET's and SIGMET's. Adoption of recommendations in this study will reduce the number of Convective SIGMET's and SIGMET's received by controllers but will increase the number of CWA's. Pilots conceivably might not receive all pertinent information.

RECOMMENDED SOLUTION. Require that en route controllers broadcast to pilots all CWA's as well as SIGMET's and Convective SIGMET's. Workload should not be increased if recommendations in sections on Duplication of CWA and One-Time Broadcasts are adopted.

COMMUNICATIONS BETWEEN THE CFWSU AND THE CWSU.

PROBLEM. The CFWSU is frequently called by en route and terminal supervisory personnel for weather information and interpretations of local weather. Thus, a considerable amount of crosstalk exists between FAA operational personnel and the CFWSU meteorologist. The CWSU meteorologist is seldom, if ever, a party to these conversations. In addition, the CWSU meteorologist is not required to disseminate CWA's to the CFWSU. The lack of well-defined communication and coordination between the CFWSU and the CWSU's weakens the CWSU role and causes confusion, redundancy, and loss of credibility to air traffic control personnel.

RECOMMENDED SOLUTION. The CFWSU meteorologist should make the appropriate CWSU meteorologist a party to all weather briefings provided to FAA personnel within the Center area. This can be accomplished by including the CWSU meteorologist in a conference call or can be accomplished by the CFWSU meteorologist calling the CWSU meteorologist separately. Conversely, the CWSU meteorologist should communicate all CWA's to the CFWSU.

OTHER PROBLEMS AND SOLUTIONS

1. All ARTCC floor supervisors should attend the CWSU meteorologist's morning briefing. This is especially important if the meteorologist has determined that the day's weather will severely impact air traffic flow.

2. The meteorologist should have the authority to enter GI messages via the PVD keyboard or other input/output devices, but only after coordinating such anticipated action through the weather coordinator.

3. The CWSU meteorologist should be required to make up current radar maps as is done in the Denver CWSU (see appendix A). This information should be coordinated with the weather coordinator, "walked through" the Center, and discussed with controllers whose sectors will be affected by the hazardous weather.

4. The CWSU meteorologist has responsibilities to disseminate weather information interfacility as well as intrafacility. The Center staff should not feel that the CWSU meteorologist is responsible solely for en route weather services. (Reference 1, chapter 2, paragraphs 6a and 6g, and attachment 1, paragraph 6.1, should be reaffirmed.)

5. Terminal facility personnel should rely more on their assigned CWSU meteorologist than the local WSFO or the CFWSU meteorologist. The situation at the O'Hare Tower is particularly noteworthy (appendix A, O'Hare Tower, items 4 and 5). The CWSU meteorologist is better equipped to interpret the local

weather than the CFWSU meteorologist and will be disseminating consistent weather information everywhere within his area of responsibility.

6. The CWSU meteorlogist's morning briefings to en route controllers should also be provided in abbreviated form to all En Route Flight Advisory Service positions, all high-use terminal facilities, and the adjacent CWSU. In the current system, this information can be disseminated by telephone, hotline, or GI messages.

SUMMARY

Substantial near-term improvements can be made to current weather data dissemination methods utilized in the National Airspace System. All recommended changes can be implemented in the near-term except those few exceptions noted. Most of the recommendations take the form of procedural changes, but at least one important recommendation suggests the procurement of relatively inexpensive off-the-shelf equipment. Some recommendations, if approved, will require what are believed to be minor IBM 9020 software changes. The recommendations, collectively, should radically improve the services the CWSU meteorologists are able to deliver to the air traffic control community.

CONCLUSION

Procedural changes that pertain directly to the Center Weather Service Unit (CWSU) operation can be effected through an amendment to Federal Aviation Administration (FAA) Order 7210.38. Changes involving the air traffic function can be implemented through amendments to the Air Traffic Controller's Handbook, FAA Order 7110.65B (reference 2). Recommendations that suggest new procurements may be first tested and demonstrated in the Technical Center's Aviation Weather System Laboratory, followed by a short field test. Changes to Air Route Traffic Control Center (ARTCC) Computer and Automated Radar Terminal Systems (ARTS) III systems software can also be tested and demonstrated at the Technical Center using the En Route System Support Facilty (ARTCC Computer) and Terminal Automation Test Facility (ARTS III). Work orders should be coordinated with Air Traffic Service (AAT-550) if these suggested tests are approved.

REFERENCES

1. Center Weather Service Unit (CWSU) Handbook, FAA Order 7210.38, February 23, 1979.

2. Air Traffic Controller's Handbook, FAA Order 7110.65B, January 1, 1980.

APPENDIX A

TRIP REPORT

The Technical Center team observed considerable variability in the operation of the Center Weather Service Unit (CWSU's) visited and their interfaces to the Air Traffic Control (ATC) System. This variability is due to CWSU equipment difference, interpretation of Federal Aviation Administration (FAA) Order 7210.38, and inherent variation in operation and equipment within the ATC environment.

In addition, there are some common features of all CWSU operations that slow dissemination and provide users with weather data that are not necessarily pertinent to the facility needs. Further, there is an overlap and possible inconsistency between information disseminated by the National Weather Service (NWS), Weather Service Forecast Offices (WSFO), and the National Severe Storm Forecast Center (NSSFC), and the CWSU's. The major issues and observations are summarized by facility:

Cleveland Air Route Traffic Control Center (ARTCC) (Oberlin, Ohio)

1. The CWSU meteorologist does not always conduct a conference-type briefing for all interfacility users (CWSU Handbook, FAA Order 7210.38, attachment 1, paragraph 3.2.1a). In addition, due to control room duties, not all floor supervisors are able to attend the intrafacility briefing offered.

2. There is little Pilot Report (PIREP) dissemination between appropriate Flight Service Station (FSS) Enroute Flight Advisory Service (EFAS) positions and the CWSU (FAA Order 7210.38, attachment 1, paragraph 3.2.1b).

3. The meteorologist does not have authorization to enter General Information (GI) messages via the plan view display (PVD) keyboard or supervisory 1052 keyboard printer. The weather coordinator is required to perform this task.

4. GI weather messages are not tailored to Center control areas and their associated facilities (terminals, FSS's) as implied in FAA Order 7210.3E (Facility Operation and Administration), paragraph 820.C.

5. There is little person-to-person contact between air traffic control specialists and the CWSU meteorologist within the Air Route Traffic Control Center (ARTCC). (See Denver ARTCC section.)

6. Convective significant meteorological information (SIGMET's) are issued by the NSSFC, Kansas City. SIGMET's are issued by nine NWS forecast offices. Both message types are often outdated when received and may conflict with the in-house generated Center Weather Advisory (CWA). This results in controller confusion and lack of confidence in the data.

7. Excessive time is consumed by individually telephoning weather information to facilities that do not have a flight data entry and printout (FDEP) position.

8. There is frequent ARTCC computer saturation in severe weather situations preventing or slowing the weather data dissemination that utilizes the GI message mode of information flow.

9. Controllers do not transmit all SIGMET's/Convective SIGMET's to pilots when workload is high and are not required to transmit CWA's (FAA Order 7110.65B, change 1, paragraph 41a).

10. The CWSU meteorologist does not have the authority to intercept or halt the dissemination of Convective SIGMET's and SIGMET's to ultimate users in the FAA or to modify their content. This is necessary if the Convective SIGMET/SIGMET contains the same relative information as the previously issued CWA. FAA Order 7210.38 does not address this issue adequately.

11. CWA's are not sent to the Central Flow Weather Service Unit (CFWSU) (FAA Order 7210.38, chapter 2, paragraph 6h).

Cleveland Hopkins Tower
(Cleveland, Ohio)

1. SIGMET's received from the NWS via electrowriter are occasionally so garbled they are unreadable (figure A-1 is an actual sample). At this facility an FDEP was available to receive an ungarbled message.

2. Current SIGMET's (if readable from the electrowriter) are manually entered into a data dissemination system (Datavision™) which displays information on video monitors at selected controller positions.

3. FAA personnel at this facility believe that adequate services are provided by the CWSU meteorologist, but in the view of the Technical Center team, the full potential of the CWSU is not being utilized.

Cleveland Lakefront Airport
(Cleveland, Ohio)

1. This tower is FDEP-equipped. It receives GI messages disseminated by CWSU meteorologists (CWA's, SIGMET's, and Convective SIGMET's). The tower supervisor observed that considerable information received was irrelevant to his facility.

Chicago ARTCC (Aurora, Illinois)

1. Items 1, 2, and 5 through 11 at the Cleveland ARTCC are applicable to this Center.

2. There is minimal communication between the CWSU meteorologist and the Chicago O'Hare tower. The meteorologist does not brief any other major ATC facilities in this ARTCC area (FAA Order 7210.38, chapter 2, paragraph 6g).

3. The CWSU meteorologist does not issue weather information statements under the nomenclature "Center Weather Advisory." Such advisories here are called "Special Weather Statements" (FAA Order 7210.38, attachment 1, paragraph 6.2.3).

4. The CWSU meteorologist issues no "Special Weather Statements" if the Covective SIGMET covers the weather situation adequately. However, he often waits for NWS transmission of Convective SIGMET's before making this decision. As a result, late transmission of "Special Weather Statements" are the rule rather than the exception.

5. ARTCC controllers view the CWSU meteorologist's function as primarily Center-oriented with interfacility dissemination having a much lower priority. As a result, external facilities rarely get the services the meteorologist has the potential to deliver (FAA Order 7210.38, chapter 2, paragrah 6g).

6. ARTCC controllers believe the Weather Coordinator can perform the meteorologist's weather functions adequately. This viewpoint has been formed following midnight-shift experience when the CWSU is not staffed (also gleaned from FAA Order 7210.38, chapter 2, paragraph 7).

7. ARTCC controllers do not believe that the CWSU meteorologists provide good short-term weather products.

8. Phone lines to non-FDEP facilities must be shared with the air traffic control function (i.e., there is no weather hotline).

9. Weather coordinators communicate with the CFWSU meteorologist, as well

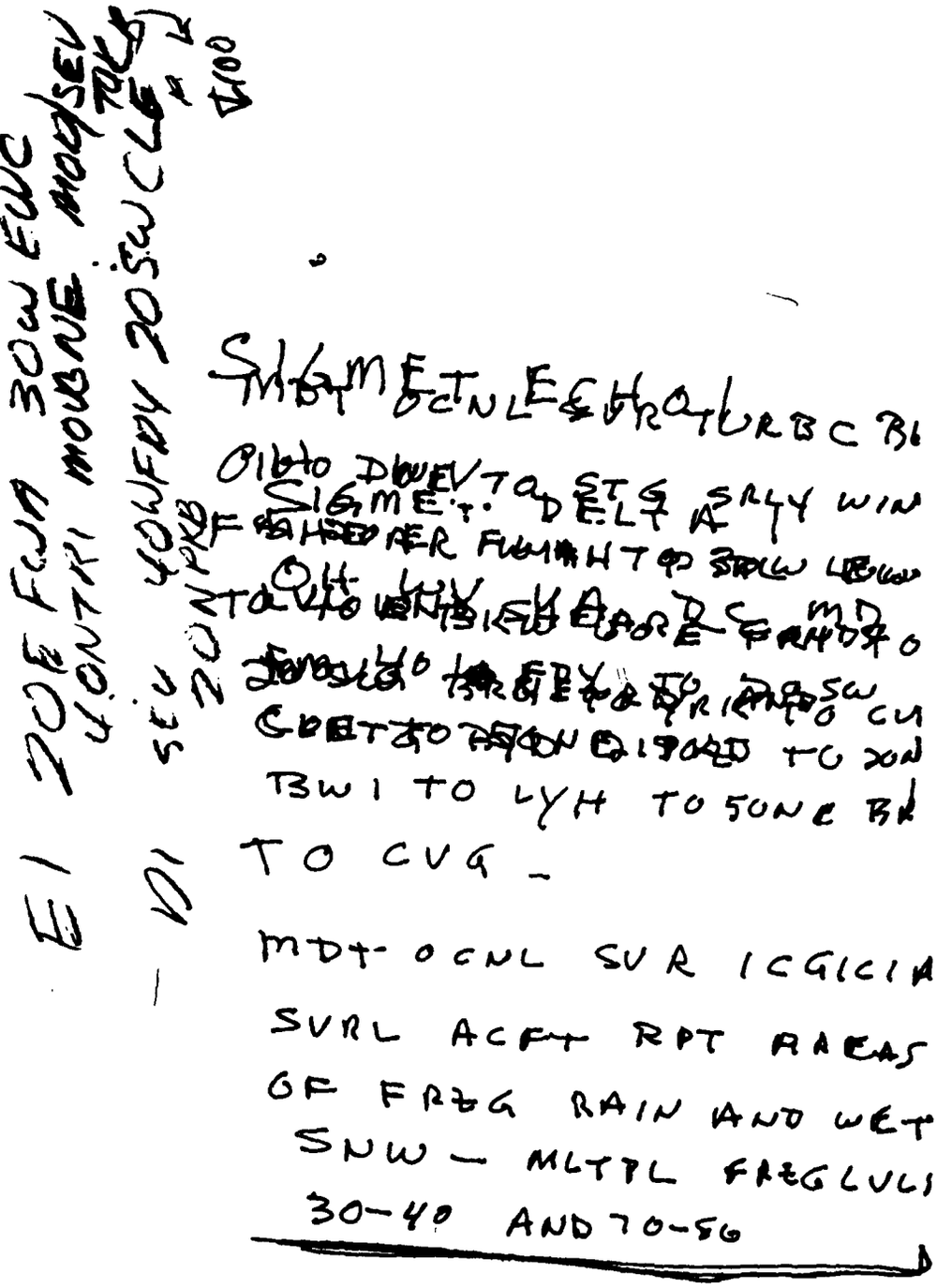

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FIGURE A-1. ELECTRO WEATHER MESSAGES

as the CWSU meteorologist, and compare the weather information provided by both. The CFWSU information is often preferred.

O'Hare Tower (Chicago, Illinois)

1. CWA's are received from the Center at the FDEP position in the tower cab. This information is passed hand to hand to the five positions in the cab for broadcast. It is then sent to the IFR (radar) room via pneumatic tube for distribution there. (There is no FDEP position in the IFR room). Weather data dissemination within the O'Hare Tower is a very time-consuming process. This aggravates an already slow dissemination process.

2. The Terminal Radar Approach Control (TRACON) receives daily morning briefings from the CFWSU via telephone hotline. Briefings are also updated by the CFWSU when any unusual changes in weather are expected.

3. The TRACON has two hotlines to CFWSU. The assistant chief receives the briefings and/or updates, then passes the information orally to all positions in the IFR room. Information is then telephoned to the tower cab.

4. Air Traffic personnel have more faith in the accuracy of weather products issued by the local Weather Service Office at O'Hare and by the CFWSU than those delivered by the CWSU.

5. There is very little contact between the CWSU meteorologist and O'Hare controllers. There are no morning briefings or updates (FAA Order 7210.38, chapter 2, paragraph 6g).

6. SIGMET's/Convective SIGMET's are passed by hotlines to non-FDEP satellites. This method sometimes causes delay of receipt due to workload of the receiving facility.

DuPage County Airport Tower (DuPage County, Illinois)

1. This facility has voice communications with Chicago ARTCC (and thus with the CWSU meteorologist). However, passing any weather information ties up the active control line (shared with the air traffic control function).

2. The tower has an electrowriter connected to the local FSS. However, the weather events are sometimes outdated before the data are received at the tower.

3. The tower receives only SIGMET's/ Convective SIGMET's from the CWSU/ Weather Coordinator. There are no daily briefings or briefing updates.

DuPage County Flight Service Station (DuPage, Illinois)

1. There is very little contact between the EFAS position and the CWSU meteorologist. This FSS receives no briefings, CWA's, or updates from the CWSU nor does the FSS relay PIREP's to the CWSU (FAA Order 7210.38, chapter 2, paragraph 6g).

Denver ARTCC (Longmont, Colorado)

1. The GI message format is used to send CWA messages to FDEP-equipped facilities. However, saturation of the ARTCC computer is a daily problem that causes entry delay of GI messages into the system. Messages are often outdated before receipt by the concerned facilities. During extreme saturation periods, some GI messages are never accepted by the computer.

2. Center hotlines are used for weather dissemination to non-FDEP facilities.

3. Denver EFAS is the only external facility which receives a routine daily briefing from the CWSU meteorologist.

4. The facility does not use the Bell 300 System to play continuous recordings of Center weather briefings and updates. This is not addressed in FAA Order 7210.38.

5. There is very good rapport between CWSU meteorologists and Center air traffic control personnel.

6. The CWSU meteorologist prepares a Center oriented map of radar echo positions and other pertinent information and walks this map through the Center giving special briefings to sector controllers on real-time weather. This appears to be a valuable service to sector controllers not observed elsewhere.

Denver Stapleton Tower
(Denver, Colorado)

1. Weather messages from the Center are received on FDEP. The supervisor handwrites messages in expanded text and passes the hard copy to controllers. Valuable time is lost in this process.

2. According to ATC personnel, the tower does not receive CWA's. However, such messages should be received on FDEP since CWA's are known to be sent.

3. There is occasionally a problem disseminating weather data to non-FDEP satellite airports due to hotline and dial-up phone overload.

4. There is no coordination of weather (namely, PIREP's) between the local EFAS position and this facility (FAA Order 7110.65B, change 3, paragraph 4).

5. The tower personnel rely more on the CFWSU than on the CWSU for weather briefings. CFWSU weather information is compared with inputs from the local WSFO for consistency. This manner of obtaining weather information is unwarranted considering the high quality of the Denver CWSU meteorological team.


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